UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/639,625	08/15/2000	Steven Towle	42390P7195	1669

7590 04/19/2004

BLAKELY, SOKOLOFF, TAYLOR & ZSFMAN LLP
Seventh Floor
12400 Wilshire Boulevard
Los Angeles, CA 90025

EXAMINER	
OWENS, DOUGLAS W	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 04/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/639,625	TOWLE ET AL.	
	Examiner	Art Unit	
	Douglas W Owens	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 January 2004* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13,15-21,23,24,26-32 and 34-53* is/are pending in the application.

4a) Of the above claim(s) *18-20* is/are withdrawn from consideration.

5)☒ Claim(s) *29-32,34 and 35* is/are allowed.

6)☒ Claim(s) *1-3,5-13,15-17,21,23,24,26-28 and 36-53* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1 – 3, 5 – 13, 15 – 17, 21, 23, 24, 26 – 28 and 36 – 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over US patent No. 6,054,398 to Pramanick in view of US patent No. 6,255,217 to Agnello et al.

Regarding claims 1, 8, 9, 10, 11, 13, 21, 24, 36, 41 – 44 and 46, Pramanick teaches a method of forming a dielectric, comprising:

forming a fluorine containing film (Fig. 3; 216; Col. 4, lines 3 – 5)) on a substrate;

forming via openings in the fluorinated material; and

exposing the fluorine containing film top surface and sidewalls to a reducing plasma (Col. 4, lines 58 – 64).

Pramanick does not teach placing the substrate in a reaction chamber or forming the plasma remote from the chamber. The step of exposing the fluorine containing film would have required a reaction chamber to control the plasma flow and to prevent undesired elements from reacting with the fluorine containing film. It would have been obvious to one of ordinary skill in the art to place the substrate in a reaction chamber, since it is desirable to control the reaction with the plasma. Pramanick is silent with respect to the source of the plasma. One having ordinary skill in the art would have

been required to select a known method of providing the plasma. It would have been required and obvious to one having ordinary skill in the art to select a known plasma source, such as remote plasma, since Pramanick does not disclose the preferred plasma source.

Pramanick teaches a method, wherein low dielectric fluorinated layers are used. Pramanick does not teach that the low dielectric constant fluorinated layer comprises a-C:F, parylene AF4, carbon-doped SiOF, fluorinated organic polymers, fluorinated siloxane polymers, and SiOF. The cited materials are well known low dielectric constant fluorinated layers. It would have been obvious to one having ordinary skill in the art to select a known material that is well suited for the intended use. The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Pramanick does not teach a method that further includes forming an etch stop layer over the fluorine depleted surface. Agnello et al. teaches a method including forming an etch stop layer (24) over a fluorine depleted surface (Col. 3, lines 45 – 57; Col. 4, lines 7 – 20). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Agnello et al. into the method taught by Pramanick, since it is desirable to prevent the unwanted diffusion of copper to the dielectric material (Agnello et al., Col. 1, lines 34 – 42).

Regarding claims 2 and 37, Pramanick teaches a method, wherein the fluorine containing film is a substantially planar insulating layer. Pramanick does not explicitly

teach that the substrate is a silicon wafer. Pramanick teaches a method, wherein the fluorine containing insulating layer is formed over a polysilicon gate (110; Col. 3, lines 41 – 46). Polysilicon gates are commonly formed over silicon substrates, as is well known in the art. It would have been obvious to one having ordinary skill in the art to select a silicon substrate since silicon is a known material that is well suited for the intended use.

Regarding claim 3, Pramanick teaches a method, wherein the fluorine containing film has exposed sidewalls.

Regarding claims 5 – 7 and 38 – 40 Pramanick teaches a method, wherein the plasma is formed from a hydrogen bearing precursor gas comprising NH_3 (Col. 4, lines 61 – 64). Pramanick does not teach a method, wherein the plasma is formed from a carrier gas comprising N_2, Ar or He. It would have been obvious to one of ordinary skill in the art to use the carrier gas since a carrier gas is needed to transport the plasma. N_2, Ar and He are known carrier gasses that would have each been well suited for the intended use.

Regarding claims 12, 23 and 45, Pramanick teaches a method, further comprising depositing a conductive material (Fig. 4, 202; Col. 4, lines 31 – 37) in the via openings.

Regarding claims 15 and 26 Pramanick teaches a method further comprising depositing a silicon nitride etch stop layer (117) over the fluorinated layer before forming the via openings.

Regarding claims 16, 27 and 47, Pramanick does not teach a method, wherein the plasma is formed in a reaction chamber from ammonia (NH_3) and argon at a pressure between 1 mTorr and 50 Torr and an RF power between 100 and 500 watts. Pramanick is silent with respect to the pressure and power used in the reaction chamber. One having ordinary skill in the art would have been required to arrive at the optimal pressure and power through obvious and routine experimentation.

Regarding claims 17, 28 and 48, Pramanick does not teach a method, wherein the ammonia is passed into the reaction chamber at a flow rate in the range of 10 sccm to 3 liters per minute. The flow rate of delivering plasma is a known variable that is subject to optimization. It would have been obvious to one of ordinary skill in the art to find the optimal flow rate through routine experimentation. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Regarding claim 49 – 53, Pramanick does not teach forming an etch stop layer comprising silicon nitride over the fluorine depleted layer. Agnello et al. teaches forming the etch stop layer comprising silicon nitride. It would have been obvious to one of ordinary skill in the art to include the teaching of forming the silicon nitride layer for reasons discussed above.

Allowable Subject Matter

3. Claims 29 – 32, 34 and 35 are allowed.

Response to Arguments

4. Applicant's arguments with respect to claims 1 – 3, 5 – 13, 15 – 17, 21, 23, 24, 26 – 28 and 36 – 48 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

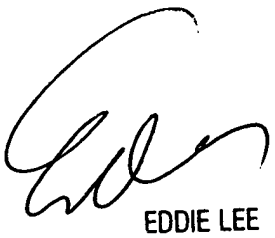
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 571-272-1662. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DWO



EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800